

Software Partitioning Technologies

Tim Skutt

Smiths Aerospace

3290 Patterson Ave. SE

Grand Rapids, MI 49512-1991

(616) 241-8645

skutt_timothy@si.com

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Agenda

- **Software Partitioning Overview**
- **Smiths Software Partitioning Technology**
- **Software Partitioning in the Vetronics Domain**

The Problem

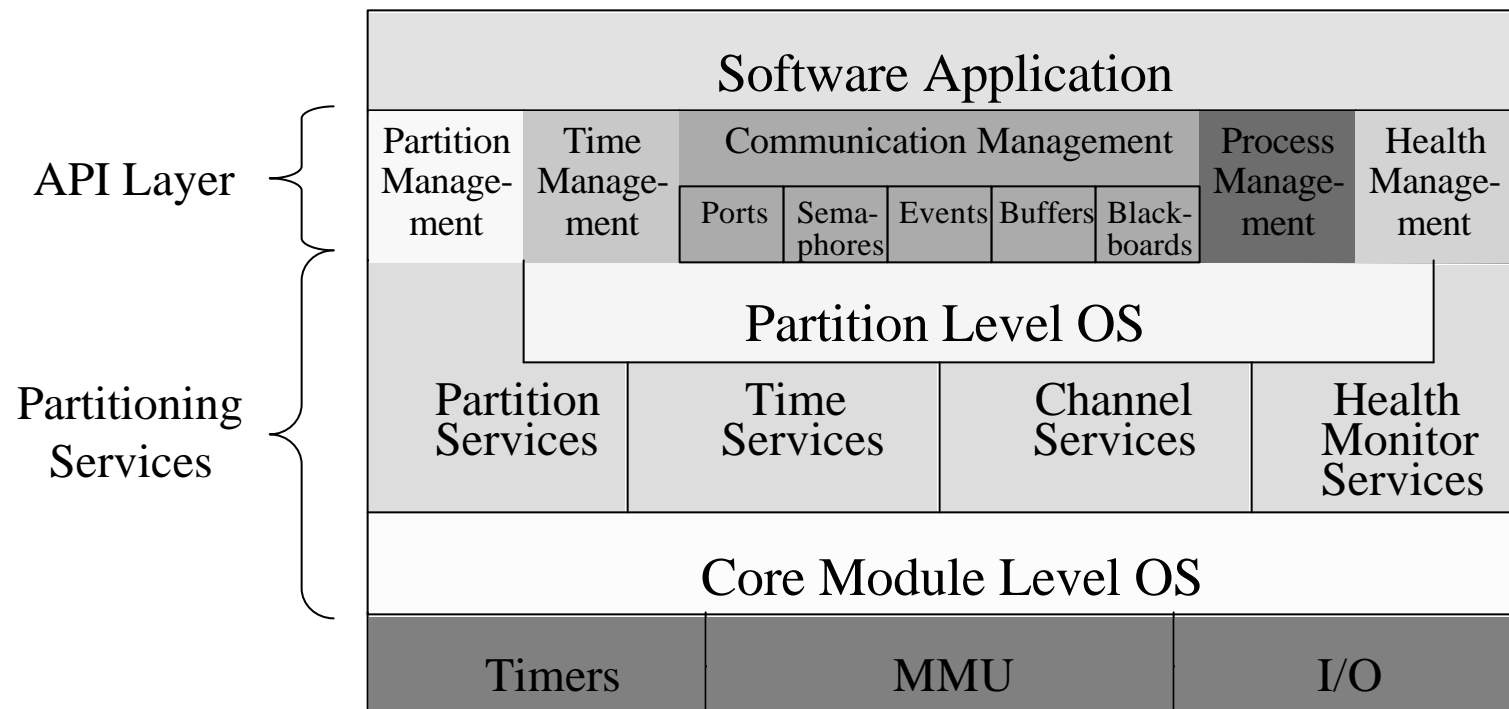
- How do we implement systems to take advantage of rapidly increasing COTS processing resources while at the same time:
 - Reducing system obsolescence by increasing software portability
 - Enabling new software applications to be integrated into legacy systems with minimal impact on
 - Military system validation process
 - Civil system FAA certification process
 - Reducing life-cycle costs and increasing functionality for “new” systems
 - Enabling the integration of applications at multiple levels of criticality/security on the same processing resource

The Solution -- Software Partitioning

- Integrate software on powerful, standard hardware through Software Partitioning.
- Software Partitioning provides:
 - Application Independence
 - All application interactions (I/O, CPU usage and Memory usage) are controlled and deterministic
 - Hardware Independence
 - Provides an industry standard Application Program Interface (API) to the operating environment (POSIX and ARINC653)
 - Increases portability by providing a “black box” I/O architecture
 - Reduced system modification/certification/validation costs
 - New applications can be added to system spare partitions without affecting the other partitions in the system
 - Only those parts of the system that change must be re-certified/re-validated

The Solution -- Software Partitioning

- ARINC 653 defines Software Partitioning and provides an API
 - Developed by aviation community consensus
 - Applicable to other domains (vetronics, medical, industrial)



Smiths Software Partitioning Technology

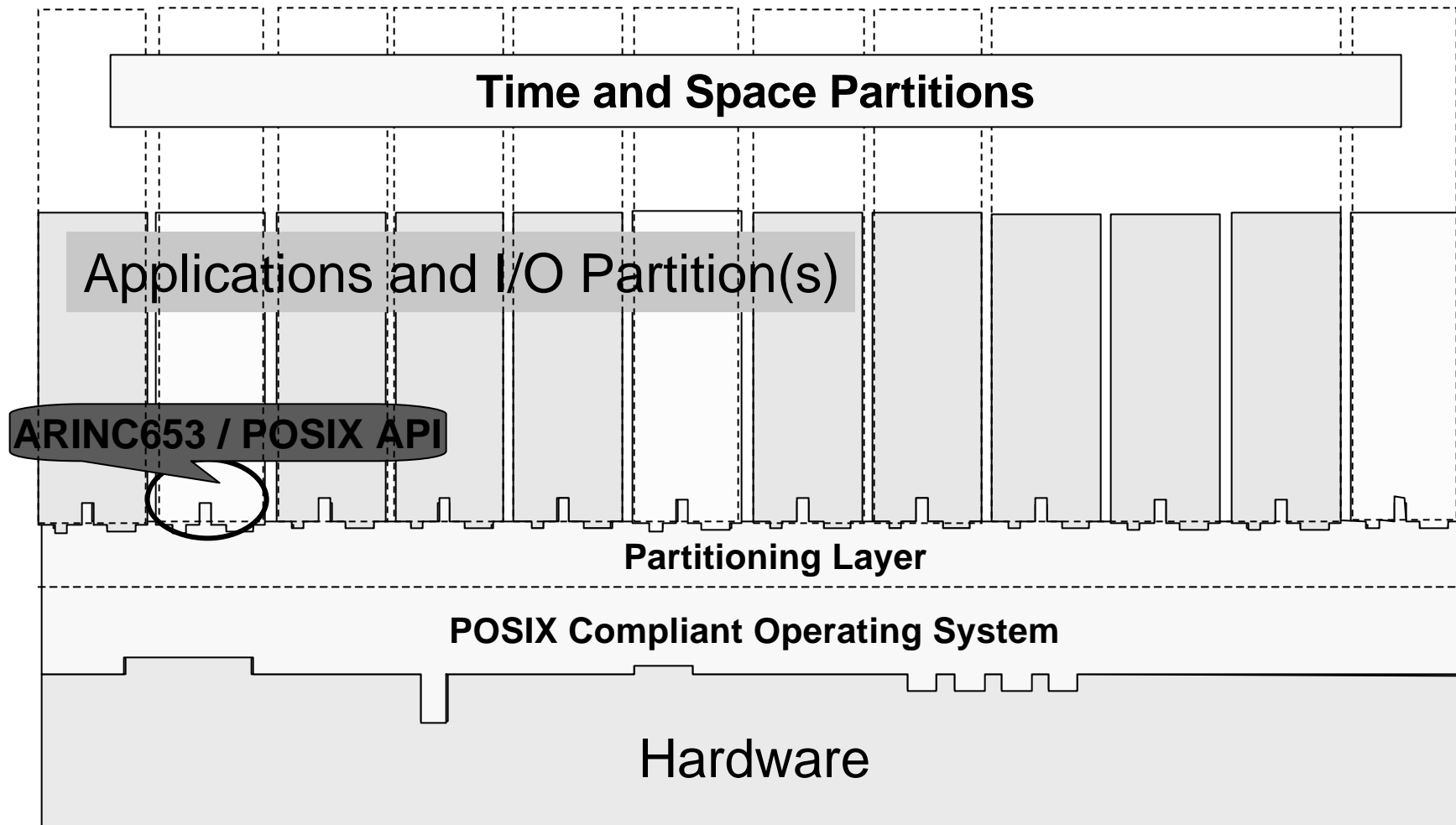
- **Smiths has developed the Software Partitioned Operating Environment (SPOE) to embody Software Partitioning**
- **SPOE in a nutshell**
 - **Partitions multiple applications on a single CPU in conformance with the ARINC 653 specification**
 - Provides CPU throughput, memory, and I/O protection between apps.
 - Guarantees CPU throughput, memory availability, and I/O resource access for apps.
 - **Isolates changes in functionality – reducing re-test and re-qualification efforts for upgrades**
 - **Enables integration of apps. at different criticality/certification levels**
 - **Provides tiered health management – captures and handles anomalies at the appropriate scope**
 - **Provides ARINC 653 and POSIX APIs for use by applications**

Smiths Software Partitioning Technology

■ SPOE in a nutshell (continued)

- Supports multiple languages (Ada83/95, C, C++, ...)
- COTS development tool sets (Rational Apex, GNAT Ada, gcc)
- Hosted on multiple POSIX compliant COTS operating system platforms (LynxOS, Linux, Solaris)
- Hosted on Multiple COTS Hardware Platforms:
 - Pentium -> Desktop PC Development and Embedded Target
 - PowerPC -> Embedded Target
 - SUN -> Desktop/Server Development Environment
- Supports multiple physical I/O mediums (VME, PCI, 1553, ARINC 429, Ethernet, ...)
- Scalable I/O partition provides support for a multi-processor environment

SPOE Implementation Architecture



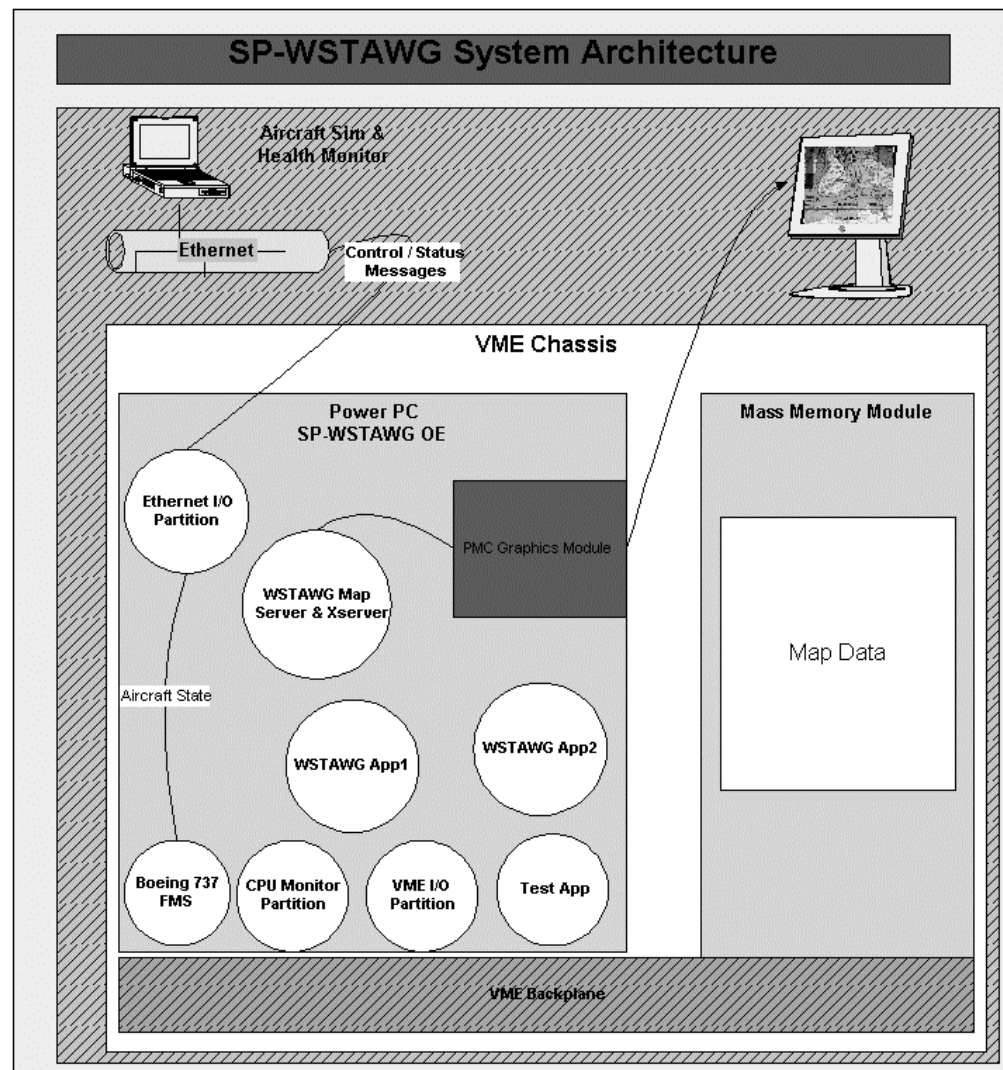
Smiths Software Partitioning Technology

- **Smiths' technology development efforts**
 - **Participant in SAE AS-5 committee (Avionics Architecture Definition Language)**
 - **Integrated Modular Architecture (IMA)**
 - **Standardized within avionics community**
 - **Avionics (or Advanced) Computing Resource (ACR)**
 - **General purpose computing platform for software partitioning**
 - **Improves logistics (spares) and reduces cost through commonality**
 - **Applicable to vetronics as well as avionics**
 - **Safety/mission critical networking technology**
 - **Participant in WSTAWG OE IPT**
 - **Developing a demonstration prototype software partitioned WSTAWG API compliant OE**

Software Partitioned WSTAWG OE

■ Demonstrates:

- WSTAWG OE API apps. in a partitioned system
- Interaction between apps. written to dissimilar APIs
- Portability of WSTAWG OE API apps.
- Integration enabling features of SPOE



Software Partitioning for Vetronics

■ Benefits

- Provides “assured” real-time embedded processing for multiple applications on a single or multiple processing resources
 - Guaranteed Quality of Service (QoS) for applications
- Software partitioning will reduce system life-cycle costs
 - Eases initial software integration effort
 - Multiple applications built by different vendors can be integrated by 3rd party vendor at the object level
 - 3rd party and other vendors don’t need to “see” proprietary source
 - Enables new applications to be added to the system while retaining validated status of the existing system
 - New applications (FBCB2 for example) can be added to “spare” partitions
 - Enables impact of changes/upgrades to legacy applications to be isolated to one “partition”
 - Reduces amount of processing hardware required
 - reduces initial system costs
 - reduces lifecycle cost of spares, etc.

Software Partitioning for Vetronics

■ Benefits (continued)

- Abstraction of software from hardware (and I/O)
 - Facilitates embedded simulation and training - operational software is used unmodified for simulation and training
 - Software portability is enhanced
- ACR technology
 - Reduces logistical footprint
 - Common modules - fewer module types to “spare”
 - Upgrades to modules can result in fewer modules for the same platform
 - Provides “pre-validated” hardware environment